

7.

Comparative Biology of Salticid Spiders at Rancho Grande, Venezuela. Part III. Systematics and Behavior in Representative New Species.¹

JOCELYN CRANE.

*Research Zoologist, Department of Tropical Research,
New York Zoological Society.*

(Text-figures 1-8).

[This is one of a series of papers resulting from the 45th, 46th and 47th Expeditions of the Department of Tropical Research of the New York Zoological Society, made during 1945, 1946 and 1948, under the direction of Dr. William Beebe, with headquarters at Rancho Grande in the National Park of Aragua, Venezuela. The expeditions were made possible through the generous cooperation of the National Government of Venezuela and of the Creole Petroleum Corporation.]

[The characteristics of the research area are in brief as follows: Rancho Grande is located in north-central Venezuela (10° 21' N. Lat., 67° 41' W. Long.), 80 kilometers west of Caracas, at an elevation of 1,100 meters in the undisturbed montane cloud forest which covers this part of the Caribbean range of the Andes. Adjacent ecological zones include seasonal forest, savanna, thorn woodland, cactus scrub, the fresh water Lake Valencia, and various marine littoral zones. The Rancho Grande area is generally subtropical, being uniformly cool and damp throughout the year because of the prevalence of the mountain cloud cap. The dry season extends from January into April. The average humidity during the expeditions, including parts of both wet and dry seasons was 92.4%; the average temperature during the same period was 18° C.; the average annual rainfall over a 5-year period was 174 cm. The flora is marked by an abundance of mosses, ferns and epiphytes of many kinds, as well as a few gigantic trees. For further details, see Beebe & Crane, *Zoologica*, Vol. 32, No. 5, 1947. Unless otherwise stated, the specimens discussed in the present paper were taken in the montane cloud forest zone, within a radius of 1 kilometer of Rancho Grande.]

CONTENTS.

	Page
Introduction	31
Subfamily Lyssomaninae	
<i>Lyssomanes bradyspilus</i> sp. nov.	31
Subfamily Salticinae	
<i>Semorina brachychelyne</i> sp. nov.	35
<i>Semorina megachelyne</i> sp. nov.	38
<i>Ashtabula furcillata</i> sp. nov.	39
<i>Sassacus flavicinctus</i> sp. nov.	41
<i>Sassacus ocellatus</i> sp. nov.	44
<i>Phiale flammea</i> sp. nov.	47
<i>Mago denticheleis</i> sp. nov.	49
References	52

¹ Contribution No. 840, Department of Tropical Research, New York Zoological Society.

INTRODUCTION.

The eight species described in the present paper have been selected from among other Rancho Grande salticids for two reasons. First, they represent a number of different stages and directions in salticid evolution; and, second, special experimental display data and/or examples of the earliest instars have been assembled in each. Part I of this series (Crane, 1948.1) dealt monographically with several species of *Corythalia*, while Part II (1948.2) described the methods of study. In the succeeding parts, which will be based largely on *Corythalia* and the present group of species, it is proposed to discuss the releasing mechanisms of display, to compare post-embryological development and, finally, to evaluate evolutionary trends.

With the exception of Text-figure 8F, which was drawn from life at Rancho Grande by Mr. Kenneth Gosner, all the illustrations are the work of Miss Louise A. Moore.

The types are deposited in the collections of the Department of Tropical Research, New York Zoological Society, New York 60, N. Y.

Lyssomanes bradyspilus sp. nov.

(Text-fig. 1)

Diagnosis: Retromargin of fang groove with 6 teeth, the 2 proximal minute, none crowded toward fang base; basal segment of chelicera in male with cluster of 3 to 7 dorsal distal spines; fang toothless; no fringes on first metatarsi, which are straight; no cluster of dorsal tibial spines on palp, its distal apophysis very small, blunt; bulb with three strong, spinous, distal processes; epigynum with two pairs of large rounded bodies distinct, the anterior pair the smaller and practically contiguous. Abdominal black spots present or absent.

COLOR.

Color in Life: Adult male. Cephalothorax: Integument of carapace translucent green, without dark pigment, varying from a yellowish-green, especially in recently molted

AUG 16 1949

examples, to apple green (Ridgway). Ocular quadrangle including black eye tubercles with varying amounts and proportions of yellowish- or silvery white and orange-red scale hairs, the latter usually placed anteriorly. AME rimmed with silvery-white; the eyes themselves clear apple green, shifting to black (see under BEHAVIOR); other eyes black. A narrow submarginal clypeal band of orange-red scale hairs, directed downward. Chelicerae fangs brown. Palpal bulbs pinkish to orange. Integument of legs translucent apple green, without dark pigment except for black tarsal pads. Abdomen: Integument translucent green, sparsely covered with short hairs, ranging from apple green to dull green-yellow, usually with a short, median basal stripe of darker green. Hairs short, rather sparse, of same color as integument. Paired, subdermal black spots on posterior half of abdomen present or absent, strong or weak, rarely appearing—if at all—until three or four days after final molt; any number up to four pairs may develop. A patch of white hairs often present at distal end of dorsum.

Adult female. Differs from male as follows: Scale hairs of ocular quadrangle, including eye tubercles, tend to be more uniformly yellowish- or silvery white, with the orange-red reduced or absent, except for a variable, sometimes conspicuous, crest behind AME; subdermal clypeal band of orange-red absent, replaced by a band of scant white hairs; palps completely green; legs usually with some dark subdermal pigment concentrated near joints; this often is confined to a single spot in antero-distal part of first tibia. As in the case of the abdominal spots, it develops, if at all, after the final molt. No female seen with more than two pairs of abdominal spots; as in the male, they develop slowly or not at all.

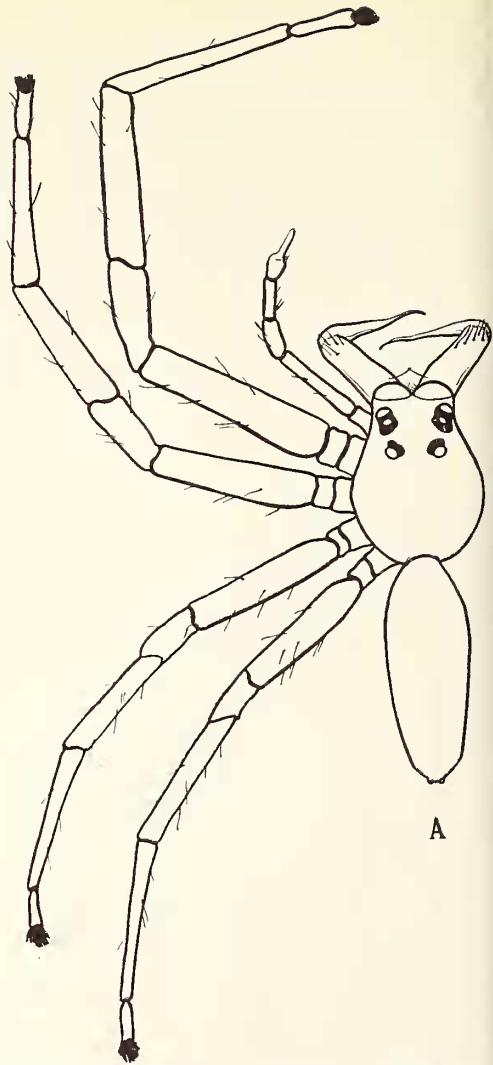
Color in Alcohol: All green fades promptly, as usual in the genus, to yellowish-white; no black leg or abdominal pigment remains; on the other hand, the orange-red clypeal band of males and the crest of females are strongly persistent and even intensified.

STRUCTURE.

Characteristics below apply to both males and females unless otherwise specified; percentages approximated; measurements of types given on p. 34.

Carapace: Height, including tubercle of PLE, scarcely more than half length; short anterior part of thoracic slope almost level, descent of posterior part moderate; width greatest midway between PLE and pedicel, wider in male (1.5 times height, 79% of length), narrower in female (1.35 times height, 71% of length); longitudinal thoracic groove well developed, lying midway between PLE and pedicel.

Eyes: Eight eyes in four distinct rows; all except AME elevated on low black tubercles, the PME on same tubercle as ALE. First row 87% as wide as second; length of

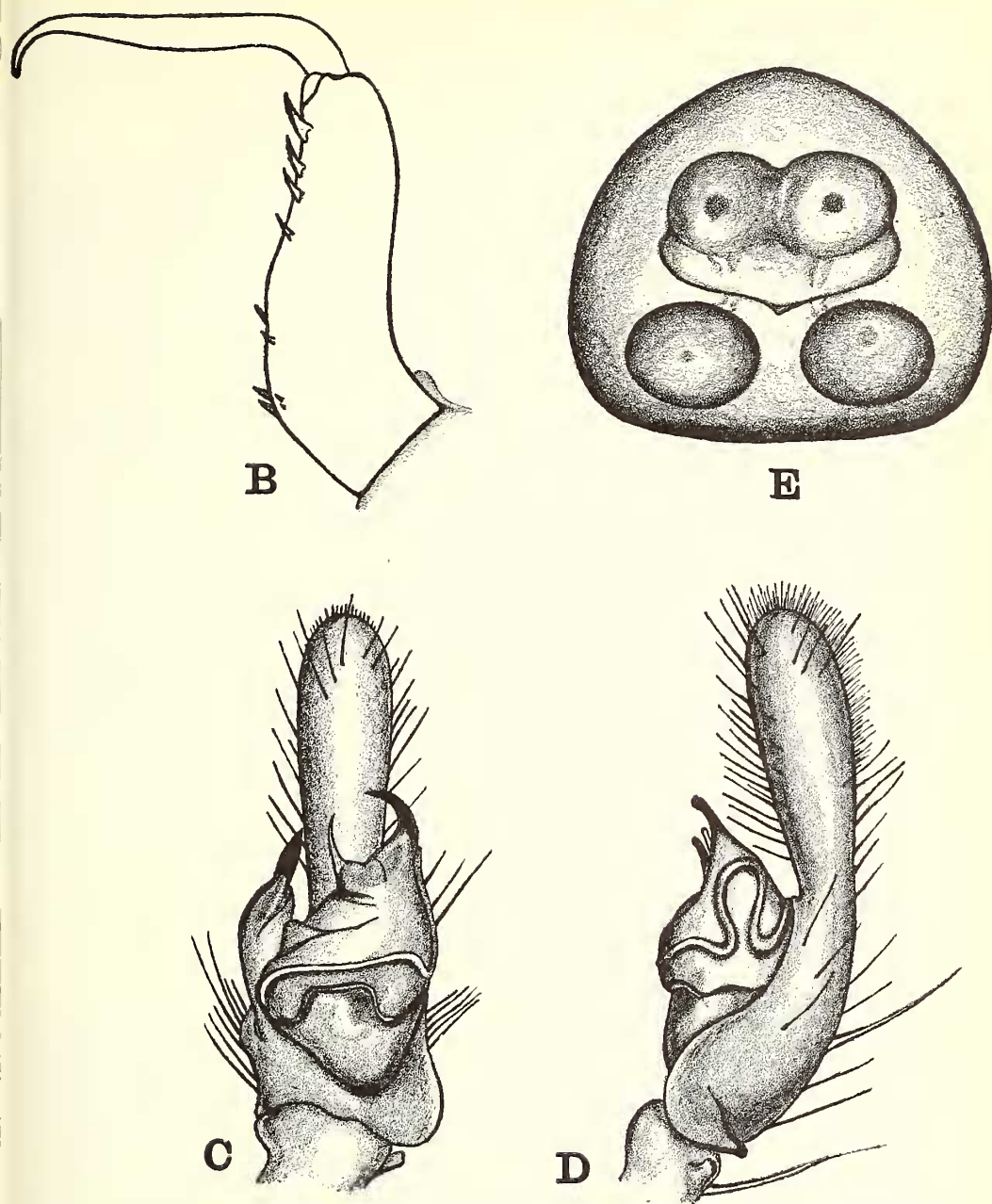


TEXT-FIG. 1. (Part). *Lyssomanes bradyspilus*. A-D holotype ♂: A, dorsal view; B, chelicera, ventral view; C, left palp, ventral view; D, same, ectal view. E, paratype ♀: epigynum.

ocular quadrangle including AME 42% of carapace length, length from ALE to PLE 27%; breadth at ALE much wider than at PLE, 46% and 34% of length respectively; ocular quadrangle length from ALE to PLE only 66% of its breadth at ALE. Diameter of AME 21% of carapace length; ratio of eyes: AME: ALE: PME: PLE: :100: 42: 11: 5: 35. AME practically contiguous, separated from ALE by about a tenth of their diameter; PME slightly closer to ALE than to PLE.

Clypeus: Height in males 38% of AME diameter; 54% in females.

Chelicerae: In males, strongly produced but of variable length, porrect, robust, divergent. Length of basal segment in best developed more than half carapace length, in least developed about half. Each with 1-2 prs. of overlapping spines near base on medial front



TEXT-FIG. 1. (Part). *Lyssomanes bradyspilus*. A-D, holotype ♂: **A**, dorsal view; **B**, chelicera, ventral view; **C**, left palp, ventral view; **D**, same, ectal view. **E**, paratype ♀: epigynum.

margin, and a group of 3 to 7 strong distal spines, the number and arrangement varying even on two sides of same individual. Fang slender and sinuous, toothless; groove weak; promargin with three small teeth near base, the smallest proximal, it and the next closer together than second and third; no tooth at base of fang; inferior margin typically with 6 teeth in a straight row, increasing in size distally, along entire edge of groove. The basal one or two, however, although apparently constant, are minute, delicate and easily destroyed; they are separated consid-

erably from each other and the distal 4, which are quite evenly spaced. In females the chelicerae are, of course, much shorter; distal spine group absent; teeth closer together, tending to be evenly spaced throughout and of more nearly equal size.

Maxillae: Parallel; width 60% of length; distal dilation slight; external angle evenly rounded without tubercle.

Lip: Breadth 90% of length; basal excavation extending 25% of length; distal end reaching slightly beyond middle of maxillae; sternal suture straight.

Sternum: Broadly scutiform; width 85% of length in males, slightly less in females; equally wide between second and third coxae; base of lip 60% as wide as anterior border in males, 50% in females; posterior end a bluntly rounded lobe extending about halfway between fourth coxae, which are separated by two-thirds of their diameter.

Legs: Tibial indices: Holotype male, first leg 12, fourth leg 11; paratype female, first and fourth legs, 13. First legs of male considerably elongated and enlarged. See Table I for formula.

TABLE I.

Lyssomanes bradypilus: Leg Formula.

	1	2	4	3
Male holotype	3.8	3.0	3.0	2.9
	1	4	2	3
Female paratype	3.2	2.9	2.7	2.6

All legs with little hair; hairs on metatarsi arranged clearly in dorsal and ventral rows, but in no sense profusely enough to be called fringes.

Spines: (Male holotype and female paratype). First and second legs: Femur dorsal 1-1-1; prolateral and retrolateral 0-1-1. Patella 0 but with a long, slender dorsal distal bristle. Tibia: Prolateral 1-1; retrolateral 1-1 in male, and on second female leg, 0-1 on first female leg; ventral 2-0-2-2, not opposite, the distal ones not terminal. Metatarsus ventral only 2-2-2, not terminal. Third leg: Femur as in first and second. Patella dorsal distal only 1. Tibia, dorsal 1-0-0-1; pro- and retrolateral, as in first and second male; ventral 0-0-2-0. Metatarsus, prolateral and retrolateral 1-1-0; ventral, male, 2-0-0, female none. Fourth leg: Femur dorsal 1-1-1; pro- and retrolateral male 0-0-1, female none. Patella as in third. Tibia dorsal as in third; pro- and retrolateral as in first and second male, except fourth female prolateral is 0-1; ventral none. Metatarsus ventral only 1 (retro) -0-0. In addition, there are rudiments on third and fourth legs of distal metatarsal spines, 2 prolaterals, 2 retrolaterals and 2 ventrals, all minute and very weak. Palpal spines: Femur dorsal 0-1-1; pro- and retrolateral distal 1; patella, dorsal distal 1; tibia, prolateral male, 0-1, female, 1-1; metatarsus female, dorsal 1-0; pro and retrolateral 1-1.

Abdomen: About 3 times longer than broad in males and young females, tapering from level of genital groove; anal tubercle not pronounced; vestigial colulus not indicated.

Palp: Femur slightly curved; patella and tibia nearly equal; tibia without dorsal spine cluster; tibial apophysis scarcely more than a truncate tubercle opposing basal ridge of tarsus; bulb with three pointed distal processes, variously shaped, and a distal tubercle (see Text-fig. 1), the whole complex structure differing only in proportions and details from Chickering's description of the palp in *L. banksi* (1946, p. 12).

Epigynum: No median notch. Two pairs of large, rounded bodies; members of anterior pair smaller, apparently contiguous; posterior pair separated by less than half their own diameter.

MEASUREMENTS.

Male holotype. Total length in alcohol 4.7 mm.; carapace length 2.1; carapace breadth 1.6; carapace height 1.1; ocular quadrangle length, AME to PLE .89, ALE to PLE .58; ocular quadrangle breadth, at ALE .96, at PLE .72; diameter AME .45, ALE .19, MLE .05, PLE .15; clypeus height .17; basal segment chelicera 1.1; patella breadth, 1st leg .38, 4th .24.

Leg Measurements, Male.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1st	2.3	.96	2.1	2.0	.55	7.9
2nd	1.9	.75	1.6	1.7	.41	6.4
3rd	1.8	.68	1.4	1.7	.41	6.0
4th	1.7	.65	1.5	1.9	.44	6.2
Palp	1.0	.44	.41	—	.58	2.4

Female paratype. Total length in alcohol 4.7 mm.; carapace length 2.1; carapace breadth 1.5; carapace height 1.1; ocular quadrangle length, AME to PLE .89, ALE to PLE .65; ocular quadrangle breadth, at ALE .99, at PLE .72; diameter AME .45, ALE .19, AME .05, PLE .15; clypeus height .24; basal segment chelicera .75; patella breadth 1st leg .34, 4th .24.

Leg Measurements, Female.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1st	2.0	.79	1.8	1.7	.41	6.7
2nd	1.7	.75	1.4	1.5	.38	5.7
3rd	1.6	.68	1.2	1.5	.38	5.4
4th	1.9	.55	1.4	1.8	.41	6.1
Palp	.82	.44	.44	—	.68	2.4

BEHAVIOR.

Locomotion: This species is a typical runner; I have never seen it jump, except in a final short pounce upon prey. The spider runs in brief spurts, during which the palps hang down practically touching the ground; during the pause they palpate the surface. No special use is made of the first legs, which take an active part in running.

Courtship Display: In Stage I, the carapace is held high, the first three pairs of legs braced somewhat forward, obliquely, and the fourth pair back; the palps hang over chelicerae, now and then tapping ground, while the abdomen hangs straight down. To superficial observation, the display consists only of posing in this position, varied with occasional bobbing of the carapace and twitching of the abdomen during rising excitement. Not until Stage II is reached, within touching distance of the female, are the first legs raised; they are then extended to the front, while the carapace sinks low and the abdomen is swung back in the horizontal position.

When the spiders are observed from their own level, however, in a straight front view, it is obvious that during display the rate of

activity of the muscles controlling the antero-median eyes is considerably increased; this gives rise to a much accelerated color "change" of the eyes, from green to black to green again. Similar eye color shifts have been known for many years in a few other salticids (e.g. Bristowe 1941, p. 419 ff. and referencés). It is apparently caused by slight motions of the long, cone-shaped optic "cups," possibly concerned with a change in focus, or in the lateral range of vision, although the exact mechanism does not seem to have been worked out. In *Lyssomanes* the shifts take place slowly but continuously during ordinary daily activity, and may be observed at close range under a binocular microscope. The mechanism works independently in the two eyes, and at a given instant either or both eyes show any proportion of green or black. To human beings, at least, the asymmetrically rolling effect is startling. In a dorsal view, the slight motions of the elongate "cups" may be simultaneously viewed through the translucent cuticle of the carapace.

Bristowe suggests the possibility that the color shifts may be useful in enticing prey. However that may be, after the Rancho Grande observations it seems to me highly probable that acceleration of muscular activity during display should be considered as a definite part of the behavior pattern, probably with an adaptive significance; its relative value among the various sign stimuli has not yet been established. This entire subject will be further considered in subsequent papers.

Once her attention has been attracted, the female usually sits quietly, sagging to one side on several folded legs; during the male's display, the rate of her ocular muscular activity also is increased.

Threat Display: Males usually took no notice of one another, and were induced to display only three times. During these periods, eye color shift was not especially noted. No differences were observed between threat position and activity from those of courtship, except that the carapace and abdomen were neither bobbed nor twitched. I never saw the long chelicerae unsheathed, although twice there was a brief, butting skirmish before one opponent retreated.

Habitat: Known only from the cloud forest near Rancho Grande. Shaken from green herbs, shrubs and low trees; one example taken from an epiphytic bromeliad growing twenty feet from the ground.

Affinities: This species holds its chief characteristics in common with a number of *Lyssomanes*, although their combination seems quite distinct. *L. quadrinotatus* Simon, (1900), from nearby mountains, has only three teeth on inferior margin of fang groove.

Material: A total of 7 adult males and 4 females have been preserved in addition to a number of young. The following have been designated as types:

HOLOTYPE: Male. Cat. No. 461199, Department of Tropical Research, New York Zoological Society; Portachuelo, Rancho Grande, near Maracay, National Park of Aragua, Venezuela; 1136 meters; cloud forest; March 20, 1946.

PARATYPE: Female. Cat. No. 45450, Department of Tropical Research, New York Zoological Society; same locality as holotype; July 9, 1945.

The name *bradyaspilus* is proposed in reference to the delayed development of the black markings after the final molt.

***Semorina brachychelyne* sp. nov.**

(Text-fig. 2).

Diagnosis: Small, brown, scale-less salticids, carapace low, abdomen long and narrow with a very slight constriction near middle, first legs greatly elongated and enlarged, extended forward and scarcely used in walking, while the abdomen is frequently elevated. Chelicerae in male scarcely a fourth length of carapace; tibial apophyses of palp both curved.

COLOR.

Color in Life: Adult male. Carapace integument dark brown, without scales and almost without hairs, except around eyes. AME clear ochraceous brown shifting to black. Palps dark. First legs brown, the femur and tibia almost black, the tarsi and sometimes the metatarsi translucent horn-color. Other legs translucent horn. Abdomen covered with fine dark brown hairs with a pair of small spots of white hairs (not scales and not shiny or iridescent) three-fifths of distance from base to tip. In one male there was a pair of faint pale spots near tip of abdomen in addition to the distinct more anterior pair.

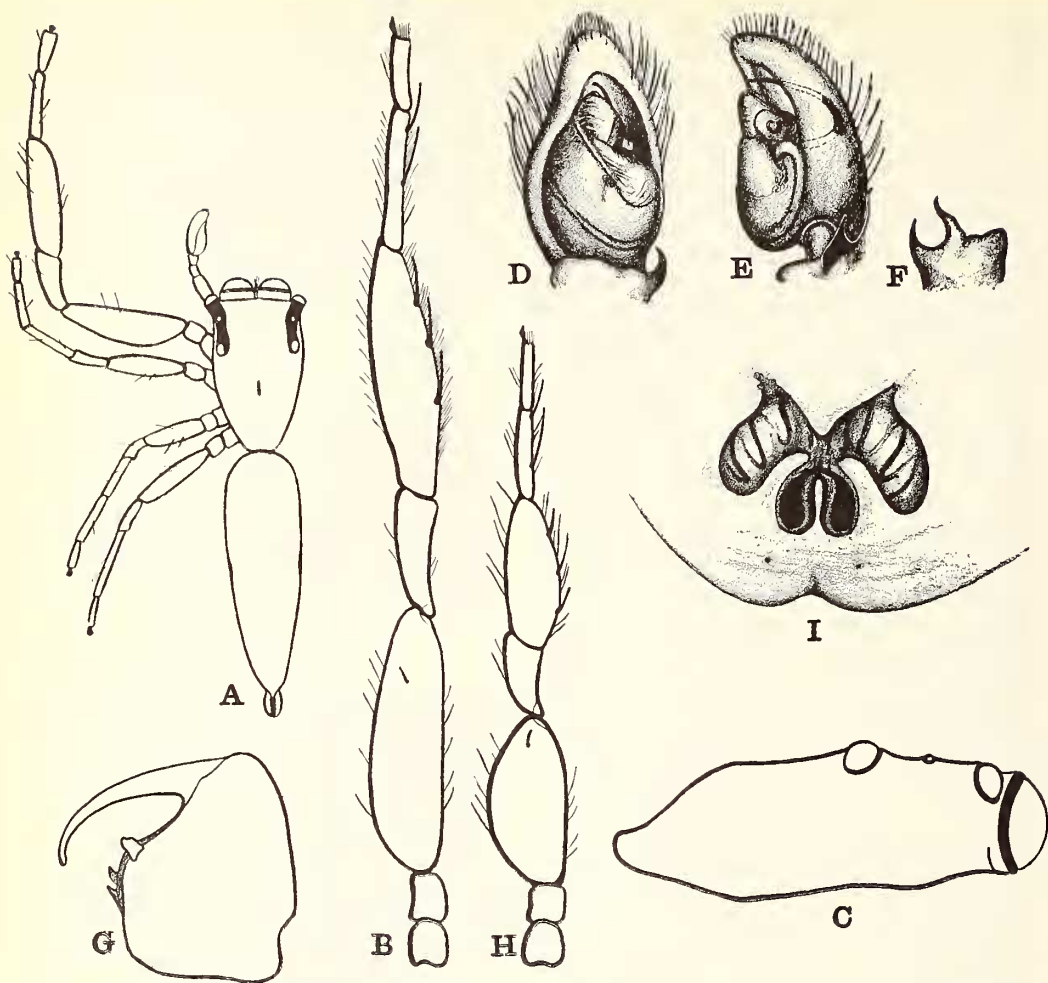
Adult female. Carapace integument yellowish-brown except sternum which is faintly pinkish. Eyes surrounded by a few yellowish hairs. Eyes themselves as in male. Tibia and tarsus of palps shiny silvery white, very conspicuous when vibrated. Swollen tibia of first legs with a ventral dark spot extending laterally; entire first leg darker than the others, which are pale translucent yellow-brown. Abdomen with a median, slightly darker stripe giving off three pairs of dark cross bars reaching middle of side. A median dark spot immediately before tip of abdomen.

Color in Alcohol: The white spot(s) of the male abdomen are practically invisible, the pattern now resembling closely that of the female, which is little altered from life.

STRUCTURE.

The characteristics below apply to both males and females unless otherwise specified; percentages approximated; measurements of types given on p. 37.

Carapace: Height only 30% of carapace length; postocular plateau long; thoracic



TEXT-FIG. 2. *Semorina brachychelyne*. A-G, holotype ♂: A, dorsal view; B, first leg, anterior view; C, carapace, lateral view; D, palp, ventral view; E, same, ectal view; F, same, tibial apophysis; G, chelicera, ventral view. H-I, paratype ♀: H, first leg, anterior view; drawn to same scale as B; I, epigynum.

slope slightly concave; width of carapace greatest at level of PLE, about twice height, and 60% of carapace length. Longitudinal groove well defined, in middle of postocular plateau.

Eyes: Eyes occupying slightly less than one-half length of carapace. Ocular quadrangle only a third as long as broad, the sides practically parallel but with PLE very slightly closer together than ALE. Carapace extending moderately beyond PLE at their level; PME median, or slightly nearer ALE than PLE. Diameter of AME about 21% of carapace length; ratio of eyes, holotype: AME : ALE : PME : PLE :: 100 : 41 : 7 : 3 : 41. AME practically contiguous, separated from ALE, which are recurved, by about one-third diameter of ALE.

Clypeus: Height in male only 5 to 6% of AME diameter, in female 11 to 12%.

Chelicerae: Short, divergent, 25% of carapace length in male, slightly shorter in fe-

male. Two small teeth on superior, one larger on inferior margin.

Maxillae: Length 54% of width in male, 64% in female; outer distal margin a blunted, obtuse angle, not produced.

Lip: Width 55% of length in male, 78% in female. Sternal suture straight.

Sternum: Width 56% of length in males, 53% in females. Anterior margin straight, a little narrower than lip base, greatest width between posterior margins of first legs; posterior end tapering, blunt-tipped extending between fourth coxae; the latter separated by less than a quarter of their thickness.

Legs: Tibial indices: Holotype male, first leg 17, fourth leg 14; paratype female, first leg 23, fourth leg 12. First leg in both sexes much elongated and enlarged with the femur and tibia especially deep (tibia depth of first leg in male 30% of its length, in female 45%). See Table II for formula. Hair scanty

except as follows. In male, first tibia and metatarsus with a short, moderately dense ventral fringe of dark hairs, and a scantier dorsal one of pale hairs; second tibia with a very scant pale fringe, dorsally and ventrally, metatarsus with a similar, slightly longer one ventrally only; third and fourth legs with very scanty ventral metatarsal fringes only. Fringes of negligible development in female.

TABLE II.

	1	4	2	3
Male holotype	2.5	1.8	1.6	1.3
	1	4	2	3
Female paratype	1.6	1.6	1.3	1.1

Spines: (From male holotype and female paratype). Femur, dorsal 0-1-1-1 throughout, the proximal two weak, bristle-like, especially in female. Patella spineless throughout. Spines otherwise as follows: First leg: Tibia, ventral only 0-2-2-2, the latter not terminal; metatarsus, ventral only 0-2-2. Second leg: Tibia, retro-ventral only 1-1-0; metatarsus, male 0, female 0-2. Third leg: Tibia and metatarsus 0. Fourth leg: Femur, retrolateral distal in male 1, in female 0; tibia and metatarsus 0.

Abdomen: Very elongate and tapering in both sexes, the breadth about a third of length, a very slight constriction near middle.

Palp: Femur practically straight; tibia more than one-half length of patella; two lateral tibial apophyses, the more dorsal longer, tapering, recurved at tip, the more ventral shorter, strongly curved antero-inwardly. Embolus slender and tapering. Distal part of bulb with a conspicuous, chitinized, knob-like protuberance directed outward.

Epigynum: An anterior pair of kidney-shaped bodies, diverging posteriorly; a posterior pair, smaller and closer together, followed by a pair of conspicuous small dark spots; a broad and shallow marginal notch.

MEASUREMENTS.

Male holotype. Total length in alcohol 5.3 mm.; carapace length 2.2, breadth 1.3, height .68; ocular quadrangle length .79, breadth 1.2; diameter AME .46, ALE .19, PME .03, PLE .19; clypeus height .02; basal segment of chelicera .55; sternum length .86, breadth .48; patella breadth, 1st leg, .38, 4th .21; abdomen length 3.2, breadth .99.

Leg Measurements, Male.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	1.7	.89	1.5	.96	.48	5.5
2	1.1	.51	.79	.65	.31	3.4
3	.82	.38	.58	.68	.31	2.8
4	1.1	.51	1.0	.89	.38	3.9
Palp	.72	.24	.14	—	.62	1.7

Female paratype. Total length in alcohol 5.3 mm.; carapace length 2.2; carapace breadth 1.3; carapace height .65; ocular

quadrangle length .79; ocular quadrangle breadth 1.2; diameter AME .45; ALE .19, PME .03, PLE .19; clypeus height .05; basal segment of chelicera .50; sternum length .96, breadth .50; patella breadth, 1st leg, .32, 4th .15; abdomen, length 3.2, breadth 1.1.

Leg Measurements, Female.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	1.1	5.8	.92	.65	.38	3.6
2	.82	.48	.62	.51	.44	2.9
3	.79	.34	.44	.55	.34	2.5
4	1.0	.48	.79	.75	.48	3.5
Palp	.65	.27	.24	—	.44	1.6

BEHAVIOR.

Locomotion: The movements of this spider in the field are absurdly reminiscent of those of scorpions or pseudoscorpions, and bear little resemblance to ant behavior. Their small size, however, makes the existence of an adaptive mimetic function extremely questionable. They are to be counted among the runners in the family, their progress being a rapid sort of scurry, with short jumps reserved for crossing gaps in the terrain, or, of course, for the final stage in catching prey. During running the palps are vibrated continually up and down, while the first legs are held straight out in front, the metatarsi and tarsi curved inward; these legs are often vibrated, scarcely or not at all touching the ground, almost as rapidly as the palps. Meanwhile the abdomen is frequently elevated and waved slightly, also in the vertical plane. Immature specimens show all these characteristics in progress, and they are typical of locomotion whether or not another individual is present. Both abdomen and first legs are invariably raised whenever any obstacle is encountered.

Courtship Display: Indistinguishable from ordinary locomotion except that the first legs are extended at a wide angle (more than 90°) and slightly more elevated, the tarsi usually bent down; often the palps are held still; there is the usual pursuit with sidling, and the abdomen, with increasing excitement, tends to remain elevated. Motionless posing with abdomen up and first legs extended at the usual angle, also occurs with excitement. In Stage II the first legs are brought close together in front, about as in simple locomotion. During courtship the female vibrates her white palps rapidly, once her attention has been gained.

Threat Display: No threat displays were seen, although a number of attempts were made to induce them.

Habitat: Known only from the montane cloud forest (about 3,600 feet) around Rancho Grande. Always shaken from shrubs and low trees.

Affinities: This species differs from Simon's Venezuelan species, known only from females (*S. seminuda* and *S. iris*, 1901), in the complete lack of shining abdominal scales in any specimens. It likewise appears distinct from Mello-Leitao's *S. lineata* (1945)

from the Argentine. No other species seem to have been referred to this genus. It differs clearly from the other Rancho Grande species (see below) in details of the chelicerae, palp and epigynum.

Material: A total of 5 adult males and 4 adult females have been preserved, in addition to a number of young. The following have been designated as types:

HOLOTYPE: Male. Cat. No. 481558, Department of Tropical Research, New York Zoological Society; Portachuelo, Rancho Grande, near Maracay, National Park of Aragua, Venezuela; 1136 meters; cloud forest; July 15, 1948.

PARATYPE: Female. Cat. No. 461200, Department of Tropical Research, New York Zoological Society; Limon Gorge, Rancho Grande, near Maracay, National Park of Aragua, Venezuela; 1100 meters; lower edge of cloud forest; April 20, 1946.

The name *brachychelyne* is proposed in reference to the relatively short chelicerae.

***Semorina megachelyne* sp. nov.**

(Text-fig. 3).

Diagnosis: Very similar to *S. brachychelyne* in general appearance. Chelicerae elongated, about half carapace length in male; tibial apophyses of palp slender and straight.

COLOR.

Color in Alcohol: Both sexes scaleless, brown except for pale second, third and fourth legs; no distinct and unvarying spots or other markings.

STRUCTURE.

Does not differ significantly from *S. brachychelyne* except as follows: Height of carapace slightly more in male (33% of length, instead of 30%); thoracic groove less distinct, transverse rather than longitudinal; ALE and PLE slightly larger, almost one-half diameter of AME. Ratio of eyes, holotype: AME:ALE:PME:PLE::100:48:8:48. Clypeus even narrower, in both sexes, about 4% of AME in male, 5.4% in female. Maxillae and sternum both narrower with little sexual difference in breadth.

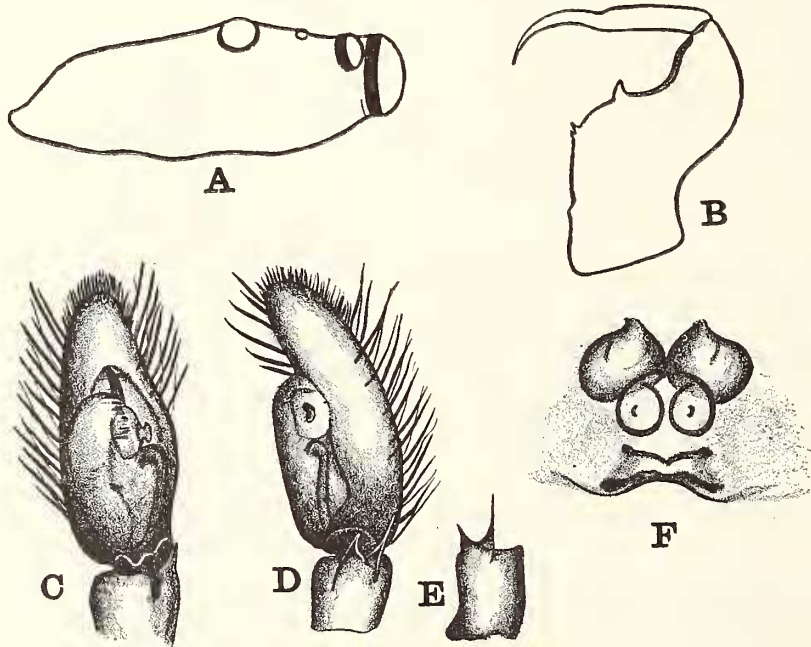
Chelicerae: These form a major specific difference, being long in males, the length of the basal segment 50% of carapace length; in females it is only 30%. They are held almost horizontally in both sexes, but are more divergent in males than in females. Tooth on inferior margin relatively larger in males of present species than in *brachychelyne*.

Legs: Tibial indices: Holotype male, first leg 12, fourth leg 12; paratype female, first leg 20, fourth leg 15. General form, proportions and fringes similar to those in *brachychelyne*. The leg formula is given in Table III.

TABLE III.

Semorina megachelyne: Leg Formula.

	1	4	2	3
Male holotype	2.3	1.7	1.5	1.2
Female paratype	1.5	1.4	1.1	1.1



TEXT-FIG. 3. *Semorina megachelyne*. A-E, holotype ♂: A, carapace, lateral view; B, chelicera, ventral view; C, palp, ventral view; D, same, ectal view; E, same, tibial apophysis. F, paratype female: epigynum.

Spines: (From male holotype and female paratype). As in *brachychelyne*, except for second leg, as follows: In male, metatarsus retroventral 1-0, not 0; female, as in *brachychelyne* male, except metatarsus is 1r-2.

Palp: Differs from *brachychelyne* as follows: Both tibial apophyses are straight, the tarsus along with its bulb is more slender, and the coiling of the tubule within the bulb is different.

Epigynum: The structure differs distinctly in the two species, as shown in the figure; the more nearly spherical shape of the four bodies is especially noticeable.

MEASUREMENTS.

Male holotype. Total length in alcohol 4.7 mm.; carapace length 2.2, breadth 1.3, height .75; ocular quadrangle length .79, breadth 1.2; diameter AME .43, ALE .21, PME .03, PLE .21; clypeus height .02; basal segment of chelicerae 1.1; sternum length .96, breadth .46; patella breadth, 1st leg .27, 4th .17; abdomen, length 2.5, breadth .82.

Leg Measurements, Male.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	1.5	.82	1.4	.96	.41	5.1
2	.96	.51	.75	.62	.34	3.2
3	.82	.38	.55	.68	.27	2.7
4	1.1	.48	.92	.85	.38	3.7
Palp	.72	.31	.17	—	.58	1.8

Female paratype. Total length in alcohol 4.0 mm.; carapace length 1.7, breadth 1.0, height .55; ocular quadrangle length .75, breadth .96; diameter AME .36, ALE .16, PME .03, PLE .17; clypeus height .09; chelicera, basal segment .52; sternum length .79, breadth .36; patella breadth 1st leg .21, 4th leg .14; abdomen, length 2.3, breadth .79.

Leg Measurements, Female.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	.79	.48	.58	.44	.27	2.6
2	.62	.34	.41	.31	.24	1.9
3	.55	.31	.34	.41	.27	1.9
4	.79	.31	.62	.55	.27	2.5
Palp	.44	.17	.14	—	.34	1.1

Behavior: Locomotion as in *brachychelyne*. No displays observed.

Habitat: Known only from lower edge of montane cloud forest, about 3,500 feet, near Rancho Grande. Collected from tree trunks and shrubs.

Affinities: See remarks under *brachychelyne*.

Material: A total of 2 adult males and 5 adult females were taken, along with a number of young. The following have been designated as types:

HOLOTYPE: Male Cat. No. 461201, Department of Tropical Research, New York Zoological Society; Water Trail, Rancho Grande, near Maracay, National Park of Aragua, Venezuela; 1100 meters; lower edge of cloud forest; May 5, 1946.

PARATYPE: Female. Cat. No. 461202. Same data as holotype.

The name *megachelyne* is proposed in reference to the long chelicerae of the male.

Ashtabula furcillata sp. nov.

(Text-fig. 4).

Diagnosis: Color in life above entirely iridescent green with white dorso-lateral band encircling carapace and abdomen; dorsal abdominal spots lacking, although sometimes faintly indicated in alcohol; carapace low; abdomen elongate; tibial apophysis of male forked.

COLOR.

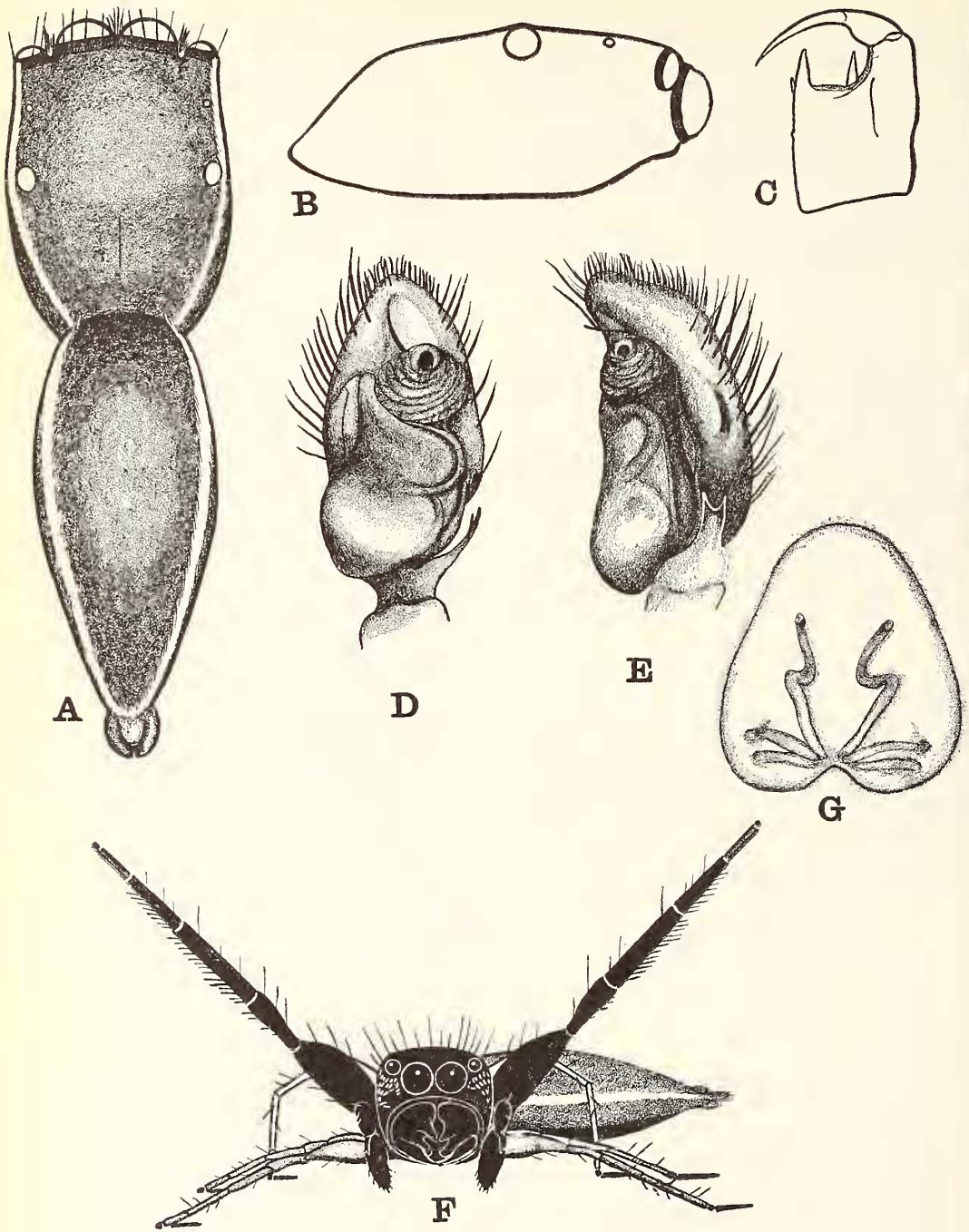
In Life: Adult male. Carapace above entirely covered with iridescent scales, rich green with bronze reflections. A white stripe starting behind ALE, bordered narrowly on ventral margin with black, passing immediately below PME and PLE, and extending along thorax almost to pedicel. Sides of carapace naked, black with a narrow white submarginal border of scales. AME narrowly rimmed with yellowish. Clypeus black, naked. Palps and first legs black (except pale 1st tarsi), other legs translucent buff. Sternum black. Abdomen covered with green scales like those of carapace, outlined dorso-laterally with white, which either continues to tip of abdomen or stops short of the tip; a white distal median spot present or absent. Moderate green iridescence on lower abdominal sides, below white stripe; venter black.

Adult female. Like male, except sides of carapace brown, not black; palps light green-yellow, not black; first legs dark brown, not black, the distal metatarsus and entire tarsus paler; other legs pale as in male, but with greenish tinge.

In Alcohol: The green iridescence is almost or completely lacking, and the scales may be largely missing, especially on the abdomen, where there may be faint traces of median spots or other markings. The white dorso-lateral bands, however, are very persistent.

STRUCTURE.

Essentially as in Chickering's description of *A. dentata* Cambridge, 1901 (Chickering, 1946, p. 248). The only significant differences are as follows: *Chelicerae*: Large prolateral tooth of basal segment of chelicera straight, not curved; enlargement at base of fang less distinct, a tubercle rather than a tooth. *Fringe* on first leg continues onto metatarsus. *Spines*: Very similar in the two species; the femoral prolateral distal spines tend to be more numerous than in *dentata* (first leg 2, not 1; 4th leg, male, 1 not 0, but 0 in female); metatarsal prolaterals tend to be fewer than in *dentata* (second leg 0, not 1; third leg 1, not 2); a weak fourth metatarsal ventral distal is present in *furcillata*, absent in *dentata*. Female *furcillata* as in male, except that femoral distal spines are reduced, about as in male *dentata*, and tibials are completely absent. *Palp*: Tibial apophysis differs radically from that of all pre-



TEXT-FIG. 4. *Ashtabula furcillata*. A-E, holotype ♂: A, carapace and abdomen, dorsal view; B, carapace, lateral view; C, chelicera, ventral view; D, palp, ventral view; E, same, ectal view; F, courtship display. G, paratype ♀: epigynum.

viously known males—*zonura* Peckham, 1894, *dentata* Cambridge, 1901, and of *dentichelelis*, *sexgutta* and *glaucua*, all of Simon, 1902; in *furcillata* alone it is not simple, but distally forked.

MEASUREMENTS.

Male holotype. Total length in alcohol 4.2 mm.; carapace length 1.9, breadth 1.4, height .75; ocular quadrangle length .82, breadth 1.2; diameter AME .34; ALE .17; PME .04; PLE .17; clypeus height .05; basal segment of chelicera 2.4; patella breadth, 1st leg, .19, 4th .21; length of abdomen 2.3, breadth 1.1.

Leg Measurements, Male.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	1.2	.79	.99	.79	.41	4.2
2	.82	.44	.55	.48	.31	2.6
3	.79	.38	.51	.51	.31	2.5
4	.99	.51	.72	.58	.34	3.1
Palp	.68	.14	.10	—	.62	1.5

Female paratype. Total length in alcohol 3.7 mm.; carapace length 1.7; carapace breadth 1.1; carapace height .68; ocular quadrangle .79; ocular quadrangle breadth 1.1; diameter AME .33; ALE .17; PME .04; PLE 17; clypeus height .03; basal segment of chelicera .36; patella breadth, 1st leg .26, 4th .21; length of abdomen 2.0, breadth 1.0.

Leg Measurements, Female.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	.82	.55	.62	.48	.31	2.8
2	.68	.38	.44	.38	.27	2.2
3	.68	.38	.38	.41	.31	2.2
4	.85	.44	.65	.51	.31	2.8
Palp	.44	.21	.41	—	.38	1.4

Tibial indices: Holotype male, first leg 11, fourth leg 17; paratype female, first leg 22, fourth leg 19. See Table IV for formula.

TABLE IV.

A. furcillata: Leg formula.

	1	4	2	3
Male holotype	2.2	1.6	1.4	1.3
Female paratype	1.6	1.6	1.3	1.3

BEHAVIOR.

Locomotion: A scurrying run, the first legs held flat and low, straight in front of body; both they and the palps palpate the surface almost constantly during progress. During pauses the first legs are usually elevated, and they and the palps jerked rapidly up and down. Both *Ashtabula* and *Sassacus* are masters of backward running, and both can jump well, although they never resort to it except in crossing gaps and in the final stage of prey capture.

Courtship Display: *Stage I*. Male carapace well elevated, abdomen swung to one side (usually the left), where it is held low, practically resting on ground; the spider sidles back and forth, raising the front legs at a wide angle and waving them up and down

in unison. The palps occasionally jerk up and down, but hang quietly during height of display. The white abdominal stripe and its bounding iridescence show clearly, little impeded by the short, pale, posterior legs. When the attention of a female has been gained, her pale, greenish-yellow palps jerk up and down rapidly and almost continuously, being conspicuous against her dark brown clypeus and mouthparts. *Stage II*. Not seen.

Threat Display: Inter-male display seems feebly developed in this species; three different pairs of males at various times, all in display condition, judging by their behavior toward females, paid little or no attention to each other, except for some brief elevation of the forelegs, which frequently takes place in any situation and appears to be of an exploratory nature.

Habitat: Known only from the montane cloud forest (about 3,600 feet) around Rancho Grande. Always taken on herbs, shrubs and low trees.

Affinities: Close to *A. dentata*; see remarks under *Structure*. It seems likely that *dentata*, *dentichelelis* and *furcillata* will prove to be no more than subspecies of *zonata*.

Material: A total of 5 adult males and 1 adult female have been preserved. The following have been designated as types:

HOLOTYPE: Male. Cat. No. 461203, Department of Tropical Research, New York Zoological Society; Portachuelo, Rancho Grande, near Maracay, National Park of Aragua, Venezuela; 1,136 meters; cloud forest; June 15, 1946.

PARATYPE: Female. Cat. No. 481559, Department of Tropical Research, New York Zoological Society; same locality as holotype; July 21, 1948.

The name *furcillata* is proposed in reference to the characteristic forked tip of the palp's tibial spine.

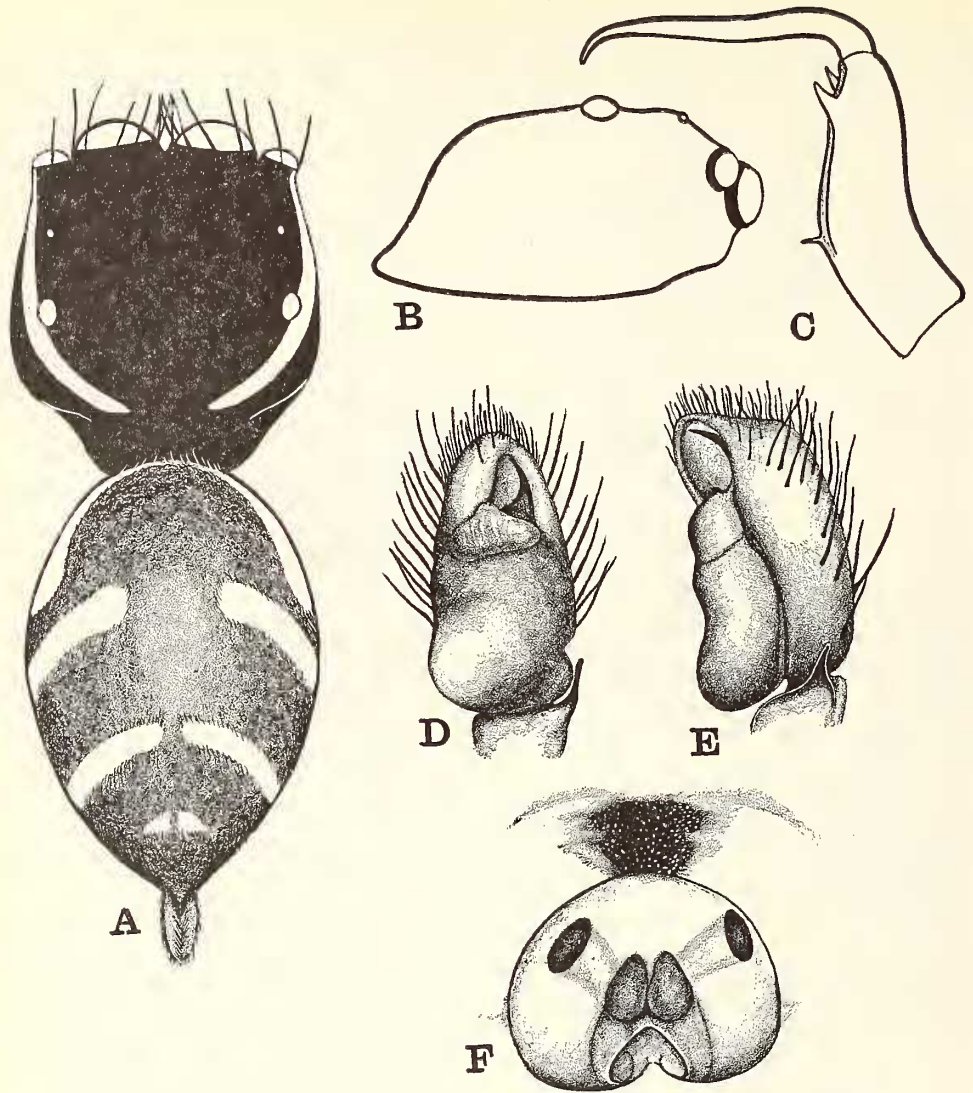
Sassacus flavicinctus sp. nov.

(Text-fig. 5).

Diagnosis: Male black with yellow on clypeus, in paired stripes and a submarginal band on carapace, and in transverse markings on abdomen. Female brown with obscure ochraceous markings. Chelicera of male strongly produced, the promargin with two teeth, far separated, the retromargin with a single strong tooth near distal end. Tibial apophysis of palp strong, simple, tapering, tip slightly recurved; embolus curved.

COLOR.

Color in Life: Adult male. Cephalothorax: Integument of carapace black, with a moderate number of long bristles in ocular region, and with lemon yellow (Ridgway) scales arranged in dense bands as follows: A pair on carapace just below dorsal eyes, converging slightly behind them and ending, without meeting, halfway down thoracic slope; a narrow submarginal band; a well-developed band of scales and scale-hairs



TEXT-FIG. 5. *Sassacus flavicinctus*. A-E, holotype ♂: A, carapace and abdomen, dorsal view; B, carapace, lateral view; C, chelicera, ventral view; D, palp, ventral view; E, same, ectal view. F, paratype ♀: epigynum.

completely covering and slightly pendent from the narrow clypeus. Mouthparts and legs black except as noted below; all tarsi brown; tibia and metatarsi of all except first legs banded brown and black in varying proportions; all legs with small anterior patches of yellow and white hairs and scales on some or all of the following segments: Femur, patella and tibia; these markings are highly variable. Sternum black with white hairs, which occur also on underside of coxae. Abdomen: A basal semi-circular band of lemon yellow scales continuing backward a third of abdominal length; behind this two pairs of short, curved bars, concave posteriorly, of which the posterior pair may join in the midline; at tip of abdomen a tiny round spot, or a short bar concave posteriorly, may be

present or absent. Center black with a triangular patch of white hair, the apex posterior.

Adult Female. Cephalothorax: Carapace black with rather weak markings of ochraceous brown scale-hairs as follows: Across clypeus and completely encircling sides of carapace and thoracic slope, absent only in middle of ocular quadrangle. Palps dark with yellowish hairs. Legs banded light and dark brown. Sternum black.

Abdomen: Dorsum with an indistinct, interrupted reticulated pattern which consists basically of an anterior basal band, followed by several pairs of hollow bands; the latter do not meet in midline, but join with the preceding band by a narrow stripe just before the center; tip of abdomen covered with

ochraceous hairs. Venter black with a few scattered light hairs.

All scale-hairs easily removed, and frequently absent in preserved specimens.

STRUCTURE.

The characteristics below apply to both males and females unless otherwise specified; percentages approximated; measurements of types given below.

Carapace: Height about half (female) or slightly less than half (male) of carapace length; anterior part of thorax flat, with a very gentle slope, rounding into rounded sides of cephalic part; descent of posterior part (less than half postocular length) abrupt, slightly concave; width of carapace greatest a little behind PLE, 1.5 times height, 67% (male) to 75% (female) of carapace length; thoracic groove scarcely indicated.

Eyes: Length of ocular quadrangle about 58% as long as broad, its sides almost parallel, though very slightly wider at ALE than at PLE; carapace extending slightly beyond PLE at their level, PME slightly nearer ALE than PLE. Diameter of AME about 20% of carapace length; ratio of eyes, holotype: AME: ALE: PME: PLE::100:48:8:44. AME practically contiguous, separated from ALE, which are slightly recurved, by about an eighth of their diameter.

Clypeus: Height 12% of AME diameter.

Chelicerae: In males strongly produced, held almost parallel to ground, divergent; length of basal segment about three-fifths of carapace length. Promargin with one slender tooth at proximal end of groove and one, long, robust, triangular, far removed, near base of fang; slightly proximal to this on retromargin a single large tooth. Fang slender, slightly sinuous. Chelicerae of females much shorter with a very short groove flanked on promargin by two teeth close together, the proximal the smaller, and one large tooth on retromargin.

Maxillae: Width about 75% of length; outer distal edge in male more dilated and obtusely angled than in female.

Lip: Breadth more than 90% of length; distal end reaching slightly beyond middle of maxillae; sternal suture curved, especially in male.

Sternum: Width 62% of length in males; wider, about 73%, in females. Anterior margin concave, narrower than base of lip; greatest width between first and second legs; posterior end bluntly pointed, extending slightly between fourth coxae; the latter separated by less than half their diameter.

Legs: Tibial indices: Holotype male, first leg 16, fourth leg 17.5; paratype female, first leg 26, fourth leg 23. First femur in both sexes enlarged, and entire first leg somewhat thickened and elongated in male. See Table V for formula. All legs with little hair.

Spines: (From male holotype and female paratype). Patella without spines throughout. First leg: Femur, dorsal 3 in distal half; prolateral distal 1 in male, 2 in female; tibia ventral only 1r-2-2, the two distal pairs close together, the proximal at beginning of second quarter of segment; metatarsus, ventral only, 0-2-2. Second leg differs from first in having tibia ventral 1r-1r-2, (male) or 1r-0-2 (female); tibia prolateral, male only, 1-1 (both small); metatarsus, female only, with 1 prolateral distal. Third leg, femur, dorsal 0-1-1-1, prolateral distal 2 (male), or 1 (female); tibia prolateral 0-1 (male) or none (female); retrolateral 0-1; ventral 0-0-2 (male) or 1p-1p-2 (female); metatarsus prolateral distal 2, retrolateral distal 2, ventral distal 2. Fourth leg, femur as in third; tibia prolateral none (male), or 0-1 (female); retrolateral 0-1 or none (variable on two sides); ventral 1p-0-2 or 1r-1r-2 or 0-0-2 (variable on two sides); metatarsus prolateral distal 0-1, sometimes in female only 0-2, the second weak; ventral distal only 2, on one side of female 0-2-2.

Abdomen: Ovate in both sexes, the breadth about 70-75% of length, widest near middle.

Palp: Femur strongly curved; tibia more than one-half length of patella; tibia with a retrolateral apophysis which tapers to a blunt, slightly recurved point. Embolus tapering from a broad base to a curved and slender tip.

Epigynum: An anterior pair of bodies well separated, a posterior pair contiguous; marginal notch deep and narrow.

MEASUREMENTS.

Male holotype. Total length in alcohol 4.51 mm.; carapace length 2.4, breadth 1.6, height 1.0; ocular quadrangle length .79, breadth 1.4; diameter AME .43, ALE .21, PME .03, PLE .19; clypeus height .05; basal segment of chelicera 1.37; patella breadth, 1st leg, .31, 4th .24.

Leg Measurements, Male.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	1.3	.85	1.0	.72	.44	4.3
2	1.1	.58	.62	.62	.41	3.3
3	1.1	.48	.55	.68	.34	3.2
4	1.2	.55	.82	.75	.34	3.7
Palp	.79	.27	.17	—	.58	1.8

Female paratype. Total length in alcohol 4.68 mm.; carapace length 2.05, breadth 1.54, height 1.03; ocular quadrangle length .83, breadth 1.4; diameter AME .43, ALE .21, PME .03, PLE .19; clypeus height .05; basal segment of chelicera .72; patella breadth, 1st leg, .34, 4th .26.

TABLE V.

S. flavicinctus: Leg Formula.

	1	4	2	3
Male holotype	1.8	1.5	1.4	1.35
	2	1	3	4
Female paratype	1.8	1.65	1.7	1.4

Leg Measurements, Female.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	1.1	.65	.68	.55	.38	3.4
2	1.2	.51	.85	.72	.38	3.7
3	1.2	.51	.79	.68	.34	3.5
4	.92	.55	.55	.48	.34	2.8
Palp	.55	.24	.24	—	.38	1.4

BEHAVIOR.

Locomotion: Compared with *Ashtabula*, this *Sassacus* is somewhat more a jumper and walker, less a scurrier; also it palpates the ground far less with the first legs and palps. Compared to the spiders of the *Plexippus* group, however, it is a poor and reluctant jumper.

Courtship Display: Stage I. Male follows female about, the carapace moderately elevated and the first legs raised at a wide angle to each other; frequently lowered; the abdomen hangs down and is trailed inconspicuously from side to side with sideling. Display tends to be in a wide semi-circle around female, once her attention has been attracted. The long chelicerae are folded but held out laterally (when not displaying they are held at right angles to each other), and the palps extend straight out also, in contrast to their usual resting position when they hang over chelicerae. With increasing stimulation, zig-zagging becomes more pronounced and a slow rocking is involved, the carapace and abdomen held stiffly and rocking as a unit. Stage II is usually attained within three to five minutes by couples of low threshold to display stimuli, and consists of the first legs thrust out in front, clear of the ground.

Threat Display: Stage I. Indistinguishable from Stage I of courtship, except that no rocking is involved. *Stage II.* It is only in the rare occurrence of this stage that the chelicerae blades are unsheathed; when two opponents are practically touching the first legs are brought upright, from the obliquely outward display position, and simultaneously the chelicerae blades are extended straight out in front, at right angles to the basal segment, which is maintained in the horizontal position typical of display. In each of the dozen or so observed encounters that reached this stage, one or the other male usually backed off promptly at this point; more rarely there was a brief tangle which ended without apparent injury. Usually one or both males retreated before reaching Stage II.

Habitat: Known only from the montane cloud forest (about 3,600 feet) around Rancho Grande. Always shaken from herbs, shrubs and low trees.

Affinities: This species appears exceedingly close to *S. arcuatus* Simon, 1902, from Tefte, in the Amazon region. From the brief description, the only apparent differences are slight distinctions in the abdominal markings and the absence, in the present form, of a yellow spot on the palp femur.

Material: A total of 5 adult males and 5 adult females have been preserved in addi-

tion to a number of young. The following have been designated as types:

HOLOTYPE: Male. Cat. No. 45451. Department of Tropical Research, New York Zoological Society; Portachuelo, Rancho Grande, near Maracay, National Park of Aragua, Venezuela; 1,136 meters; cloud forest; June 1, 1945.

PARATYPE: Female. Cat. No. 45452 Department of Tropical Research, New York Zoological Society; same locality as holotype (with which she mated); July 1, 1945.

The name *flaviceinctus* is proposed in reference to the yellow bands characterizing the male.

***Sassacus ocellatus* sp. nov.**

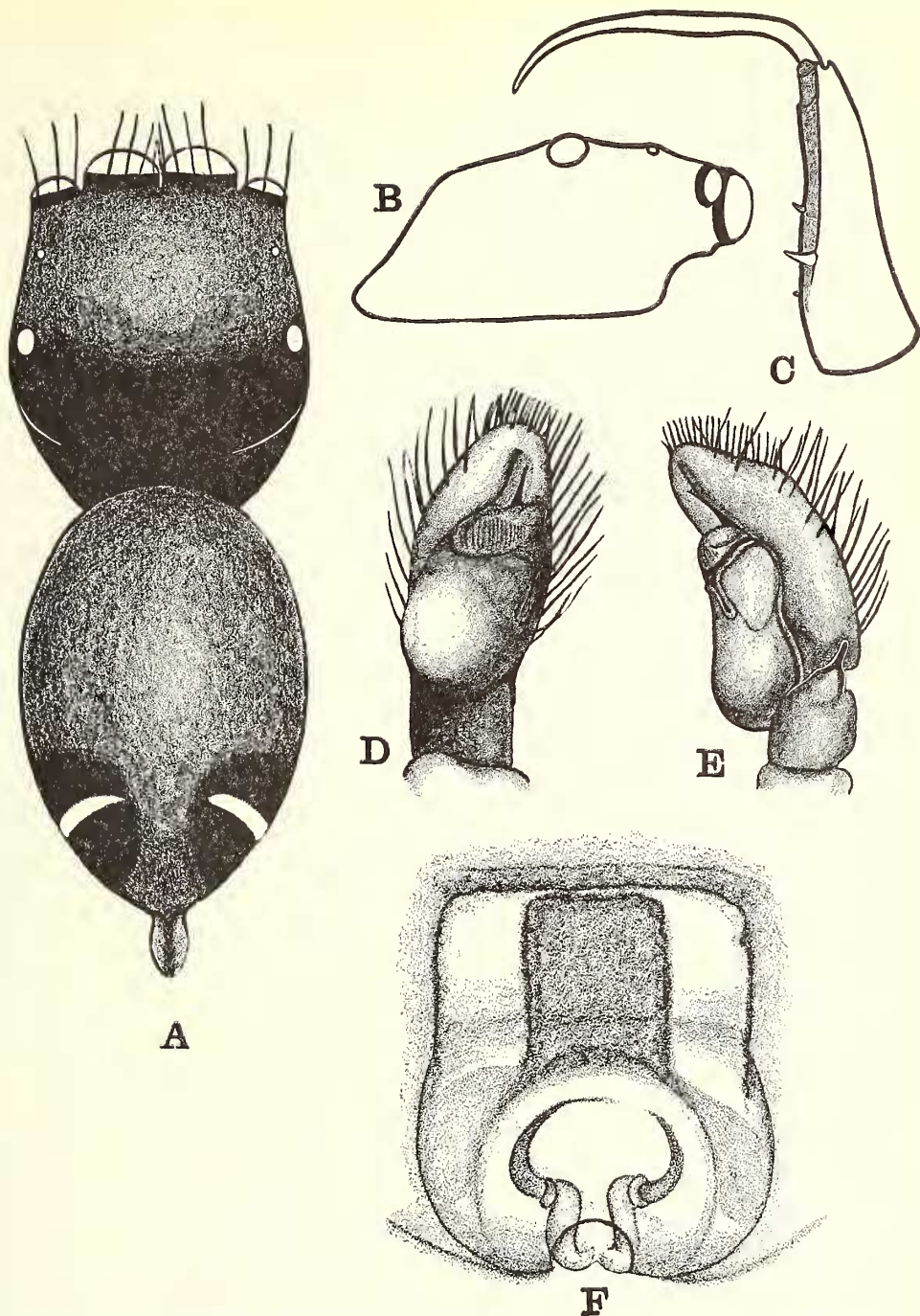
(Text-fig. 6).

Diagnosis: Both sexes iridescent green above, with a pair of black spots, each crossed by a white bar, near tip of abdomen. Chelicera of male strongly produced, the promargin with two well-separated teeth in proximal half, opposed by a single large tooth on retromargin. Spines of first tibia 2-2-2. Tibial apophysis of palp strong, simple, tapering, tip straight; embolus tip straight.

COLOR.

Color in Life: Adult male. Cephalothorax: Integument of carapace black; ocular region with a number of long bristles and completely covered with iridescent green scales which extend a little below it on sides and thoracic region. A broad band of white hairs, starting below PME on side of carapace, extends forward across clypeus. Palps, mouthparts and first legs jet black; other legs brown; two narrow, conspicuous stripes of white scales extend along anterior and posterior sides of first patella, tibia and base of metatarsus. These scales, although progressively fewer posteriorly, are present on anterior sides of all other legs, as well as on posterior sides of second legs. Sternum black. Abdomen entirely covered above, except as hereafter noted, with iridescent green scales, larger than those on carapace. On dorso-lateral surface on each side of posterior third is a large spot of velvety black scales, each with a narrow cross-bar of white scales from one-third to two-thirds of the way to its posterior edge. Around the entire abdomen laterally is a narrow band of iridescent green, confluent except in region of spot, with the dorsal green. Venter black.

Adult female. Cephalothorax: carapace as in male, with the addition of a narrow submarginal border of white scales continuing almost as far as pedicel. Entire face, around eyes, with more white scales and hairs than in male. Chelicerae black with a few white hairs basally; palps translucent brown barred narrowly with darker on joints, and with a few white hairs on patellae. All legs translucent brown except first femora, which are almost black. Sternum black. Abdomen as in male, except that there is a faint an-



TEXT-FIG. 6. *Sassacus ocellatus*. A-E, holotype ♂: A, carapace and abdomen, dorsal view; B, carapace, lateral view; C, chelicera, ventral view; D, palp, ventral view; E, same, ectal view. F, paratype ♀: epigynum.

terior band of white scales, dying out laterally in variable faint spots, while the white cross-bars on the posterior black spots tend to be on the latter's anterior margin.

In alcohol the iridescent green completely vanishes, the scales appearing dull yellowish or brownish; the abdominal black spots with white cross-bars are discernible, but far less

distinct than in life, the anterior part of the spot tending to disappear altogether. As usual, the black integumentary areas fade to brown.

STRUCTURE.

Essentially as in *S. flavicincta* except in the following respects: carapace lower, its height less than half carapace length in both

sexes, lower in male than in female. *Chelicera* of male even longer in some specimens, but varying in individuals; basal segment in holotype is 5/6 of carapace length; promargin with two small teeth well separated, along proximal half of groove; opposite their interspace, on retromargin, is a single, much larger, conical tooth. *Tibial indices*: Holotype male, first leg 21, fourth leg 19; paratype female, first leg 25, fourth leg 19. See Table VI for formula.

TABLE VI.

S. ocellatus: Leg Formula.

	1	4	2	3
Male holotype	1.9	1.5	1.4	1.2
	1	4	2	3
Female paratype	1.7	1.7	1.3	1.3

Spines: As in *flavicinctus*, but with first tibial ventral 2-2-2, not 1r-2-2, and with spines on posterior legs somewhat fewer, viz.: Second leg: Male, tibia prolateral 0, not 1-1; female as in *flavicinctus*. Third leg: Male, femur prolateral distal 1, not 2; female, prolateral 0, retrolateral 1; tibia 0 in both sexes, not with a few pro- and retrolaterals and ventrals; metatarsus (both sexes) pro- and retrolateral distals each 1, not 2. Fourth leg (both sexes): Femur prolateral 1 not 2; tibia, ventral distal only 1p in male, 0 in female; metatarsus, as in third leg, but with traces of another lateral distal pair (very weak), similar to those in *flavicinctus*; especially noticeable in female.

Palp: Tibial apophysis and embolus both straight, not curved. *Epigynum*: Radically different from that of *S. flavicinctus* (see figure); marginal notch broad and shallow.

MEASUREMENTS.

Male holotype. Total length in alcohol 3.3 mm.; carapace length 2.1, breadth 1.5, height .79; clypeus height .07; basal segment of chelicera 1.8; patella breadth, 1st leg .34, 4th leg .22; length of abdomen 2.2, breadth 1.4.

Leg Measurements, Male.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	1.2	.72	.92	.65	.44	3.9
2	.89	.55	.62	.58	.38	3.0
3	.82	.44	.51	.48	.38	2.6
4	.99	.51	.68	.65	.38	3.2
Palp	.82	.55	.14	—	.58	2.1

Female paratype. Total length in alcohol 5.0 mm.; carapace length 1.7, breadth 1.3, height .72; clypeus height .10; basal segment of chelicera .58; patella breadth, 1st leg .31, 4th leg .21; length of abdomen 3.3, breadth 2.1.

Leg Measurements, Female.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	.85	.62	.62	.48	.34	2.9
2	.68	.48	.41	.38	.31	2.3
3	.68	.41	.41	.44	.31	2.3
4	.89	.48	.65	.55	.37	2.9
Palp	.44	.21	.21	—	.34	1.2

BEHAVIOR.

Locomotion: About midway between *Ash-tabula* and *S. flavicinctus*. Its usual progress is a rapid scurry, jumping only when necessary, the first legs held forward, usually scarcely touching the ground, the palps held just clear of it. During the infrequent pauses, the first legs and palps are raised in the air and waved up and down; after which both sets of appendages sometimes palpate the ground itself.

Courtship Display: Stage I. Carapace scarcely elevated, first legs held up at about right angles to each other, and brought to ground again during the jerking, zig-zag approach to female. The long chelicerae are sheathed, the palps hanging quietly over them in the normal resting position, except for occasional vibration. Approach to the female is often quick and direct after the preliminary zig-zags. The most interesting phase may or may not be included; it consists of posing for a few moments, motionless, the legs elevated, and the abdomen twisted slightly to one side or the other; once the female was seen to perform the same motion, although that courtship was not completed. The relatively short abdomen was never swung far to the side as in the elongate *Ash-tabula*, and the black, white-barred terminal spot could not have been in full view. In the single courtship which ended in actual mating, this phase was altogether omitted. *Stage II.* This was often reached within three minutes; in one case mating followed five minutes after display began. It did not differ from that of *flavicinctus*.

Threat Display: True fighting frequently takes place in this species and even when inter-male display ends in mere threat, the chelicerae are always more or less unsheathed, which never happens in courtship. The behavior otherwise is similar except that I observed little or no trace of the side-swinging of the abdomen. During actual battle the first legs are raised directly overhead, and the palps extended laterally, widespread, out of the way; the wide-open chelicerae are opposed to those of the opponent. The two may then push back and forth for seconds, until one of the pair retreats or is bitten.

Habitat: Known only from the montane cloud forest (about 3,600 feet) around Rancho Grande. Always shaken from herbs, shrubs and low trees.

Affinities: The abdominal markings are somewhat similar to those of *S. aurantiacus* Simon, 1902, from Para, Brazil, known only from the briefly described female. The present species has a full set of 2-2-2 spines on the first tibia, instead of 1p-2-2, in both sexes.

Material: A total of 11 adult males and 9 adult females have been preserved in addition to a number of young. The following have been designated as types:

HOLOTYPE: Male. Cat. No. 461204, Department of Tropical Research, New York

Zoological Society; Portachuelo, Rancho Grande, near Maracay, National Park of Aragua, Venezuela; 1,136 meters; cloud forest; March 27, 1946.

PARATYPE: Female. Cat. No. 481560, Department of Tropical Research, New York Zoological Society; same locality as holotype; July 17, 1948.

The name *ocellatus* is proposed in reference to the eye-like abdominal markings.

Phiale flammea sp. nov.

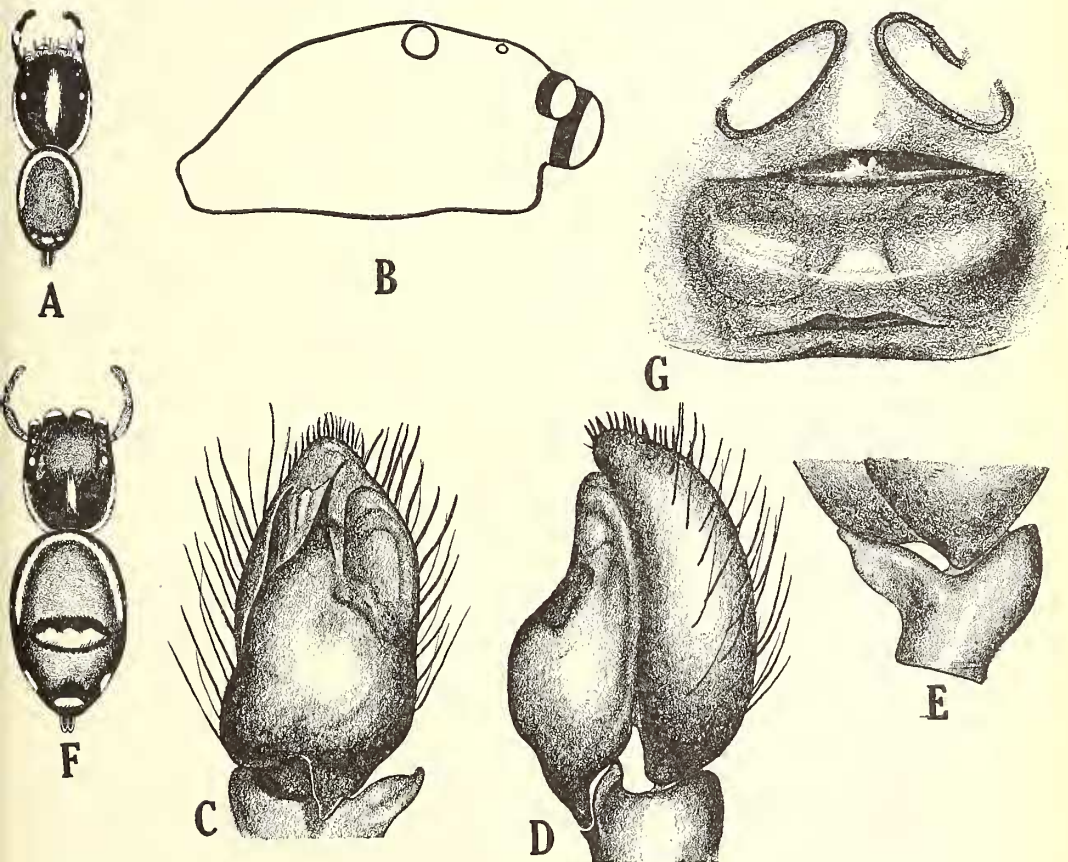
(Text-fig. 7).

Diagnosis: All carapace bands in both sexes creamy yellow. Male: Carapace markings broad, including submarginal and clypeal bands and mid-dorsal stripe; no spots near PME. Abdomen above bright rufous with white markings; median spot absent, although a faint cross-bar may be present or absent beneath rufous scales; no terminal hook on antero-lateral band; three terminal spots. Palp with tibial apophysis stout, truncate; bulb strongly bilobed; lateral process of embolus shorter than and widely separated from embolus proper. Female: Carapace markings less extensive than in male. Abdomen with reddish scales ranging almost to black; anterior abdominal band as in

male; strong, post-median cross-bar and terminal spots present. Epigynum with two strongly chitinized, external cross-bars.

COLOR.

Color in Life: Adult male. As in Chickering's description of *P. aliciae* in alcohol (1946, p. 207), except as follows: Cephalothorax: Integument of carapace, mouthparts, palps and first legs (except metatarsus and tarsus) black, not dark brown; integument of other legs translucent, medium brown. All carapace scale-hair bands distinctly buffy yellow; anterior eyes rimmed with rust; clypeus with a strong band of creamy yellow scale-hairs, instead of only "a fringe of yellowish bristles;" palp femur with dorsal scale-hair patch as in *aliciae*; a patch of white-scale hairs on proximal anterior face of first metatarsus and tarsus; variable numbers and arrangements of similar scales, diminishing posteriorly, on other segments of other legs. Abdomen: Dorsum in full sunlight often matches the flame scarlet of Ridgway; other individuals tend to orange rufous. As in *aliciae*, white markings consist of a simple anterior band extending dorso-laterally more than halfway to spinnerets, and ending without a hook-shaped inward curve



TEXT-FIG. 7. *Phiale flammea*. A-E, holotype ♂: A, carapace and abdomen, dorsal view; B, carapace, lateral view; C, palp, ventral view; D, same, ectal view; E, same, tibial apophysis. F, G, paratype ♀: F, carapace and abdomen, dorsal view; G, epigynum.

(as is characteristic of *P. dybowskii*, for example); usually it ends abruptly; sometimes there is a very slight inward curve. The "narrow, light-colored central bar" of *aliceae* is invisible in live specimens though it sometimes shows in preserved examples, beneath the rufous scales. Three small white terminal markings, in the form of spots or short bars, as in *aliceae*; carapace stripe easily rubbed, often small in preservative.

Adult female. Exceedingly variable, both in the pattern of white and dark scales, and in the vividness of the reddish abdominal markings; the individuals are separated with difficulty in pattern from at least two other species occurring typically on the lower slopes of the same mountain range. They differ from the male as follows: Cephalothorax: buff stripe and bands of carapace—median, submarginal and clypeal—much less extensive; sparse rusty hairs usually present on and around ocular quadrangle; anterior eyes rimmed with yellowish-white, not rust; some buff hairs on face below ALE; palps translucent buffy yellow, not black, and lacking buff scales; first legs black only on femur and patella; white hairs and scales of all legs reduced or absent. Abdomen: Red of dorsum exceedingly variable, practically always less bright than in male, sometimes almost black. A strong post-median, black-bordered cross-bar of white scales always present, but of variable length and breadth, sometimes confluent with ends of anterior dorso-lateral band, which is as in male; posterior spots present as in male, but of more variable size and shape, sometimes partly confluent.

STRUCTURE.

This species is so close to *P. aliceae* (known only from holotype male) that no significant structural differences emerge from a comparison of Chickering's description with our species, except for minor spine and palp differences as given below. The females are closely similar to the males in structure, except for the usual leg differences, and for the absence of the small hooked maxillary process.

Spines (both sexes): Differ from *aliceae* as follows: First leg, Female: Patella prolateral 0, not 1. Second leg, both sexes: Tibia prolateral as in first (1-0-1, not 1-1-1), ventral apparently consistently 1r-2-2, not variable; metatarsus male, prolateral distal 0, not 1, but this spine present in female. Third leg (female only): Femur prolateral distal only 2, not 1-2, retrolateral 1, not 2; tibia dorsal 0, not 1; metatarsus with slight irregularities on one side of paratype female only, retrolateral 0-1-2, not 1-1-2, ventral 1p-1p-2, not 0-2-2. Fourth leg: Femur (both sexes) prolateral and retrolateral distal respectively 0 and 1, not each 2; male tibia as on right side of *aliceae* holotype, female dorsal 0, not 1.

Palp: Differs from that of *aliceae* in its relatively greater breadth and in the char-

acter of lateral process of embolus; in *flammea* the two parts are much farther apart, though connected by a thin, horny plate; also, the lateral process is much shorter than embolus proper, and scarcely curved distally.

Epigynum: Confusing, as usual in this genus, on account of the frequent secretion of gummy matter which obscures and distorts the structure. Always distinct, however, are two strongly chitinized transverse, lip-like structures, one between the two pairs of subdermal bodies and one near posterior border.

MEASUREMENTS.

Male holotype. Total length in alcohol 4.6 mm.; carapace length 2.7, breadth 1.9, height 1.1; clypeus height .19; basal segment of chelicera .89; patella breadth. 1st leg, .41, 4th .28; length of abdomen 1.9, breadth 1.4.

Leg Measurements, Male.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	1.8	1.1	1.7	1.1	.68	6.4
2	1.3	.75	.89	.79	.48	4.2
3	1.5	.79	.85	1.1	.55	4.8
4	1.6	.75	1.2	1.3	.55	5.4
Palp	.85	.24	.24	—	.82	2.2

Female paratype. Total length in alcohol 5.1 mm.; carapace length 2.5, breadth 1.7, height 1.1; clypeus height .07; basal segment of chelicera .85; patella breadth, 1st leg .40, 4th .31; length of abdomen 2.6, breadth 1.7.

Leg Measurements, Female.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	1.2	.85	.89	.65	.51	4.1
2	1.1	.65	.65	.62	.48	3.5
3	1.3	.72	.79	.82	.55	4.2
4	1.4	.72	.99	1.1	.62	4.8
Palp	.65	.27	.31	—	.55	1.8

Tibial indices: Holotype male first leg 15, fourth leg 14; paratype female, first leg 23, fourth leg 18. See Table VII for formula.

TABLE VII.

P. flammea: Leg Formula.

	1	4	3	2
Male holotype	2.4	2.0	1.8	1.5
	4	1	3	2
Female paratype	1.9	1.6	1.7	1.4

Locomotion: Primarily a runner, although jumps are undertaken over gaps without hesitation. The first legs take little part in locomotion and are habitually waved up and down during the pauses.

Courtship Display: Stage I. Carapace elevated high; abdomen hangs down, usually touching ground and leaving a silk thread. First legs raised at 45° angle with each other and the ground. Female approached in zig-zag spurts, as the carapace is rocked from side to side, sinking alternating almost to the ground, from right to left. Palps irregularly vibrated up and down. Pursuit of female plays an important part in early stages,

but once female's attention is gained, she usually watches with first legs elevated and palps vibrating rapidly.

Stage II. Male abruptly crouches almost on ground, when two inches or less from female; his legs far outstretched in front, almost parallel, he approaches her directly with crawling motion, the palps vibrating in unison and entire body quivering. The remarkable point about Stage II in this species is that it begins at such a relatively long distance from the female.

Threat Display: As in Stage I of courtship, except that the palps are held quiet most of the time, the creamy yellow patch of the curved femur continuing that of the clypeus in an unbroken line. When approach is very close the chelicerae are opened and the first legs spread more widely, often actually touching those of the opponent. The bouts are always brief and I have never seen damage inflicted.

Habitat: Known only from the montane cloud forest (about 3,600 feet) around Rancho Grande. Always taken on herbs, shrubs or small trees.

Affinities: The closeness of this species to *P. aliciae* has already been noted. When adequate material is taken from intermediate localities, it seems likely that the distinctions will prove to be of only subspecific importance.

Material: A total of 14 adult males and 20 adult females have been preserved. The following have been designated as types:

HOLOTYPE: Male. Cat. No. 481561, Department of Tropical Research, New York Zoological Society; Portachuelo, Rancho Grande, near Maracay, National Park of Aragua, Venezuela; 1,136 meters, cloud forest; July 25, 1948.

PARATYPE: Female. Cat. No. 45453, Department of Tropical Research, New York Zoological Society; same locality as holotype; July 26, 1945.

The proposed name *flammea* refers to the color of the male dorsum.

***Mago denticelis* sp. nov.**

(Text-fig. 8).

Diagnosis: Carapace of unrubbed individuals with a median white stripe enclosing a central black spot. Male chelicera with tooth on external border; four or five teeth on inferior margin; two or three teeth, plus a series of denticles, on superior margin; tibia of palp with three unequal apophyses; epigynum with a median, rounded, superficial, pale anterior body.

COLOR.

Color in Life: Adult male. Cephalothorax: Carapace integument black, practically naked except for a conspicuous median stripe of white scales enclosing, behind level of PLE, a central black spot. The stripe begins behind AME, or near level of PME, widens to encompass the spot, then narrows once

more, ending at or behind middle of thorax. White of spot region sometimes extending laterally as a short cross-bar. Sparse chestnut and black hairs scattered on ocular quadrangle near dorsal eyes, and around AME. The wide clypeus is black and completely naked; palps, mouthparts and first pairs of legs black, except for leg tarsi. These and entire third and fourth legs translucent brown, variably and faintly banded with darker near ends of segments. Palps and all legs, especially first two, with inconspicuous white scale-hairs on antero-dorsal surfaces near joints. Sternum black. Abdomen: Pattern of dorsum very variable, formed chiefly of short hairs or scale hairs, brown mixed with gray and white areas. Usually a white lyre-shaped anterior marking—a strongly curved band with a short median basal stripe—is distinct; this is followed by several pairs of faint chevrons and some white lateral streaks and spots. The most constant markings are a pair of white terminal spots. Venter black with a pair of pale faint longitudinal stripes in middle; buff hairs rather thickly scattered over entire surface.

Adult female. Dorsal markings very similar to those of male, but posterior abdominal spots less distinct and more variable. Palps pale, translucent horn; first and second legs banded, not black; white scale-hairs on appendages almost or completely absent, though short yellowish hairs sometimes present near joints.

In alcohol, the distinctive markings usually disappear from both sexes.

STRUCTURE.

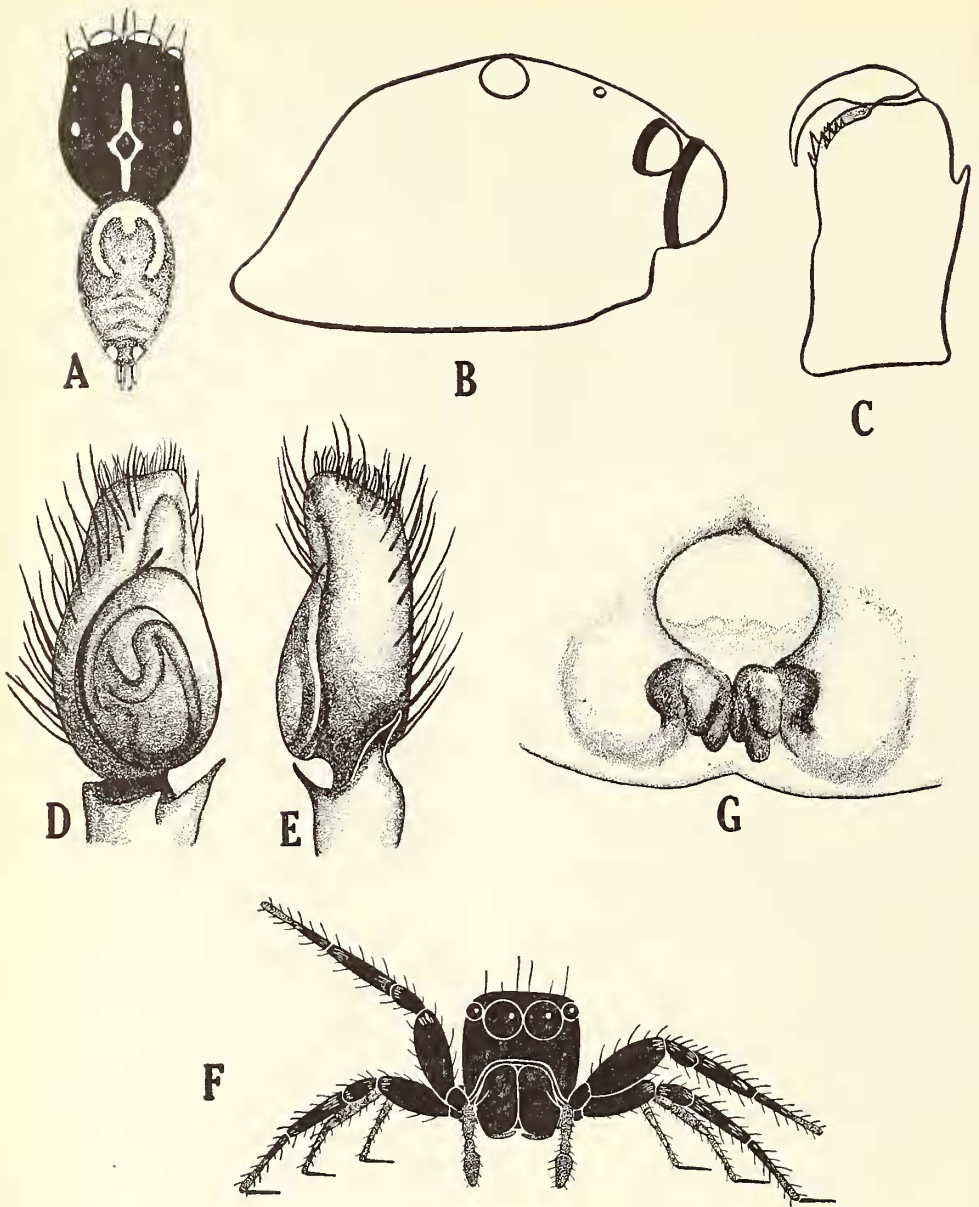
The characteristics below apply to both males and females unless otherwise specified; percentages approximated; measurements of types given on p. 51.

Carapace: Height 57% of carapace length; profile rises behind AME, gently convex, to PLE; anterior half of thorax descends very gently, posterior half abruptly; widest at level of PLE, 1.3 times height, 73% of length; total length of eye group slightly more than half carapace length. A distinct longitudinal thoracic groove, centering at level of posterior margin of PLE.

Eyes: Length of ocular quadrangle about two-thirds of breadth, its sides almost parallel but width at ALE slightly greater than at PLE; carapace extending well beyond PLE at their level; PME slightly closer to ALE than to PLE. Diameter of AME 23% of carapace length; ratio of eyes, holotype: AME : ALE : PME : PLE :: 100:46:14:40. AME practically contiguous, separated from ALE, which are slightly recurved, by about a tenth of their diameter.

Clypeus: Height 52% of AME diameter in male, 28% in female.

Chelicerae: Not produced, vertical, parallel. Length of basal segment less than 30% of carapace length. Male with a strong tooth about middle of external border. Promargin



TEXT-FIG. 8. *Mago denticelis*: A-E, holotype ♂: **A**, carapace and abdomen, dorsal view; **B**, carapace, lateral view; **C**, chelicera, ventral view; **D**, palp, ventral view; **E**, same, ectal view; **F**, threat display. **G**, paratype ♀: epigynum.

with two (rarely three) moderate-sized teeth at proximal angle, the distal the larger; distal to these is a series of minute granular teeth, numbering three or more. Inferior margin usually with four, sometimes five, contiguous, well developed teeth.

Maxillae: Less than twice as long as wide, outer distal angle little dilated.

Lip: Length and breadth similar; posterior margin slightly convex, about equal in breadth to anterior margin of sternum.

Sternum: Breadth three-fourths of length

in male, two-thirds in female, widest at anterior margin of third leg. Anterior border concave, posterior broad and convex, ending before anterior half of fourth coxae; posterior half of latter separated by about an eighth of their diameter.

Legs: Tibial indices: Holotype male, first leg 17, fourth 29; paratype female, first leg 23, fourth 16. First femur, patella and tibia moderately enlarged, less so in second leg. See Table VIII for formula. All legs with little hair.

TABLE VIII.

M. dentichelis: Leg Formula.

	1	4	3	2
Male holotype	2.1	2.0	1.9	1.9
	4	3	1	2
Female paratype	1.9	1.8	1.7	1.6

Spines: First leg: Femur dorsal 0-1-1-1, prolateral distal only 2; patella prolateral only 1 or 0; tibial prolateral 1-0-1 (both weak), or 0-0-0; retrolateral 0; ventral, 1r-1r-2, or 2-2-2; metatarsus ventral only 2-2. Second leg: Femur dorsal 0-1-1-1, prolateral distal only 2, retrolateral female only 1; patella prolateral 1 or 0; tibia prolateral 1-1-1 or 1-0-1, retrolateral 0, ventral 1r-2-2; metatarsus ventral only 2-2. Third leg: Femur dorsal 0-1-1-1, prolateral 1 or 2, retrolateral 1 or 0; patella prolateral 1, retrolateral 1; tibia prolateral 1-1, retrolateral 1-1-1; ventral 1p-0-2; metatarsus prolateral 1-1, retrolateral 1-2, ventral 2-2. Fourth leg: Femur dorsal 0-1-1-1, prolateral 1, retrolateral 1; patella prolateral 1, retrolateral 1; tibia prolateral 1-1-1 or 1-1, retrolateral 1-1-1, ventral 1p-2; metatarsus prolateral 1-1, retrolateral 1-1-2, ventral 1p-2.

Abdomen: Rather narrowly ovate, widest near middle.

Palp: Femur slightly curved, tibia about 70% length of patella; tibia with three apophyses, one small and ventral, one long and tapering, external to the first, and the third still larger, sinuously tapering, dorso-lateral. Embolus short and simple.

Epigynum: A large, rounded, median, whitish anterior area, followed by a variable arrangement of four or five subdermal, near-median tubules, related to two less distinct, well separated oval bodies.

MEASUREMENTS.

Male holotype: Total length in alcohol 5.2 mm.; carapace length 2.6, breadth 1.9, height 1.5; total length of eye group 1.4; ocular quadrangle length 1.1, breadth 1.7; diameter AME .60, ALE .28, PME .09, PLE .24; clypeus height .31; basal segment of chelicera .99; sternum length .99, breadth .75; abdomen length 2.6, breadth 1.5; patella breadth, 1st leg, .41, 4th .39.

Leg Measurements, Male.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	1.6	.96	1.4	.99	.58	5.5
2	1.4	.89	1.1	.92	.58	4.9
3	1.6	.75	1.1	1.1	.48	5.0
4	1.5	.68	1.2	1.2	.62	5.2
Palp	.89	.38	.27	—	.68	2.2

Female paratype: Total length in alcohol 5.3 mm.; carapace length 2.5, breadth 1.8, height 1.4; total length of eye group 1.4; ocular quadrangle length 1.1, breadth 1.6; diameter AME .55, ALE .26, PME .09, PLE .24; clypeus height .15; basal segment of chelicera .79; sternum length .96, breadth

.65; abdomen length 2.8, breadth 2.0; patella breadth, 1st leg .40, 4th .28.

Leg Measurements, Female.

Leg	Femur	Pat.	Tib.	Metat.	Tarsus	Total
1	1.3	.79	.96	.72	.38	4.2
2	1.3	.79	.85	.65	.44	4.0
3	1.4	.79	.92	.89	.51	4.5
4	1.5	.65	1.1	1.1	.58	4.9
Palp	.68	.41	.34	—	.38	1.8

BEHAVIOR.

Locomotion: Not specially observed in this species; however, another *Mago* (undescribed) as well as *Hypaeus* sp. are both excellent jumpers. In these the repeated pattern of ordinary progress is a deliberate walk for two or three centimeters followed by a series of short jumps; the first legs take active part in the walking and jumping, and are never raised except during display.

Courtship Display: Stage I. Carapace elevated only enough so that the motionless, hanging palps clear the ground; first legs raised at a wide angle to each other (about 135°), the other legs extending far sideways, the second pair slightly forward. Posing in this attitude is extended, but at intervals the first legs wave alternately up and down. Meanwhile the abdomen, which is held horizontally clear of the ground, is occasionally vibrated briefly up and down.

Stage II. First legs extend to front, usually not before female thrusts her first legs momentarily forward. Carapace and legs of male, in addition to the abdomen, twitch and jerk before he touches her.

Threat Display: Much more active than courtship, and in several respects quite distinct. *Stage I*: Carapace held moderately low, the abdomen either straight out as in courtship, or relaxed downward for silk attachment. First legs held with femur bent obliquely up, the other segments out; from that joint the two legs are waved up and down, usually in unison with each other, sometimes alternately. The palps hang down outside the closed chelicerae, as in courtship.

Stage II. The tempo and span of waving increases, the first legs almost meeting overhead at peak of display. Series of waves are punctuated by the rapid rubbing together of the first and second tarsi of each side, the second legs are braced somewhat forward, as in courtship, and are occasionally lifted briefly from the ground during waving.

Stage III. The two males oppose each other closely, the first legs straight overhead, practically or completely touching, the palps swung obliquely out, and the chelicerae opened wide and knocking against each other for seconds at a time. I have seen this stage reached only twice, no injury being inflicted either time. Only when one was retreating did the abdomen twitch very briefly, as in courtship.

Habitat: Known only from the montane cloud forest (about 3,600 feet) around

Rancho Grande, taken from vines on tree trunks, herbs and shrubs. Several specimens collected on upper Rancho Grande verandah, many yards from vegetation.

Affinities: Apparently related to Simon's briefly described *longidens* and *acutidens* from Brazil, although distinct in details of white markings, distal dentition of chelicerae and presence of three apophyses on palpal tibia.

Material: A total of 6 adult males and 11 adult females have been preserved in addition to a number of young. The following have been designated as types:

HOLOTYPE: Male. Cat. No. 45454, Department of Tropical Research, New York Zoological Society; Portachuelo, Rancho Grande, near Maracay, National Park of Aragua, Venezuela; 1,136 meters; cloud forest; June 6, 1945.

PARATYPE: Female. Cat. No. 45455. Taken near holotype, same locality and date.

The name *denticheles* is proposed in reference to the large outer tooth of the chelicera.

REFERENCES.

- BEEBE, W., and CRANE, J.
1947. Ecology of Rancho Grande, a Subtropical Cloud Forest in Northern Venezuela. *Zoologica*, Vol. 32, No. 5, pp. 43-60.
- BRISTOWE, W. S.
1941. The Comity of Spiders. London, printed for the Ray Society. Vol. 2.
- CAMBRIDGE, F. O. P.
1901. Arachnida. Araneidea and Opiliones, Vol. II, in *Biologia Centrali-Americana*.
- CHICKERING, A. M.
1946. The Salticidae (Spiders) of Panama. *Bull. Mus. Comp. Zool., Harvard Coll.*, Vol. 97.
- CRANE, J.
1948.1 Comparative biology of salticid spiders at Rancho Grande, Venezuela. Part I. Systematics and life histories in *Corythalia*. *Zoologica*, Vol. 33, No. 1, pp. 1-38.
1948.2 Comparative biology of salticid spiders at Rancho Grande, Venezuela. Part II. Methods of Collection, Culture, Observation and Experiment. *Zoologica*, Vol. 33, No. 9, pp. 139-145.
- MELLO-LEITAO, C. DE
1945. Arañas de Misiones, Corrientes y Entre Rios. *Rev. Mus. La Plata (n.s.)*, 4, *Zool.*, 29, pp. 213-302.
- PECKHAM, G. W. and E. G.
1894. Spiders of the Marptusa group of the family Attidae. *Occ. Pap. Nat. Hist. Soc. Wisconsin*, Vol. 2, 1892-1895, pp. 85-141.
- SIMON, E.
1900. Descriptions d'espèces nouvelles de la famille des Attidae. *Ann. Soc. Entom. France*, Vol. 69, pp. 27-61.
1901. Descriptions d'espèces nouvelles de la famille des Salticidae. *Ann. Soc. Entom. France*, Vol. 70, pp. 66-76.
1902. Descriptions d'arachnides nouveaux de la famille des Salticidae (Attidae). *Ann. Soc. Entom. Belgique*, Vol. 46, pp. 24-54.